Provisioning of Water and Food at the Desert Ports of Southern Peru, AD 1821–1879

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Introduction

The ports of Southern Peru played an essential role in the country's post-colonial economy, serving as both provisioning stations and conduits of trade. Utilising archaeological, cartographic and documentary data, I contextualise these emporia within the emergence of the Republic of Peru. The ports examined here were all commissioned by the Peruvian government along the Pacific shores with the intention of facilitating international trade and navigation along the coast. I include in this analysis most of the ports of Early Post-Colonial Peru from the modern limit between Arequipa and Ica, and the outlet of the River Loa, where the former border between Peru and Bolivia used to be (approximately, 15° 43' S to 20°43' S; figs 1–3, table 1).

Most of the southern ports, with the exception of Arica, were located in desert coves where water was unavailable, and local conditions made agriculture impossible, which presented challenges to the new national state, local governments, and Peruvian and foreign traders. Direct

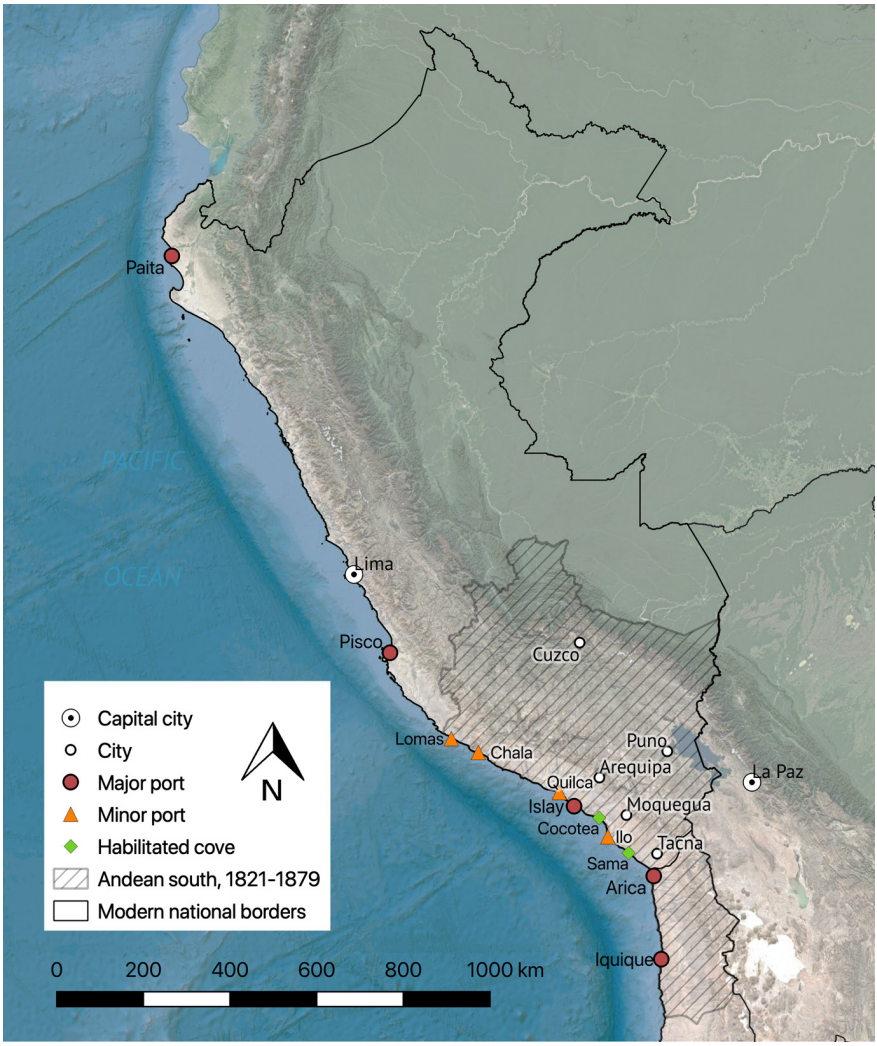

Fig. 1. Map of Peru, 1821–1879 (Created by Author).

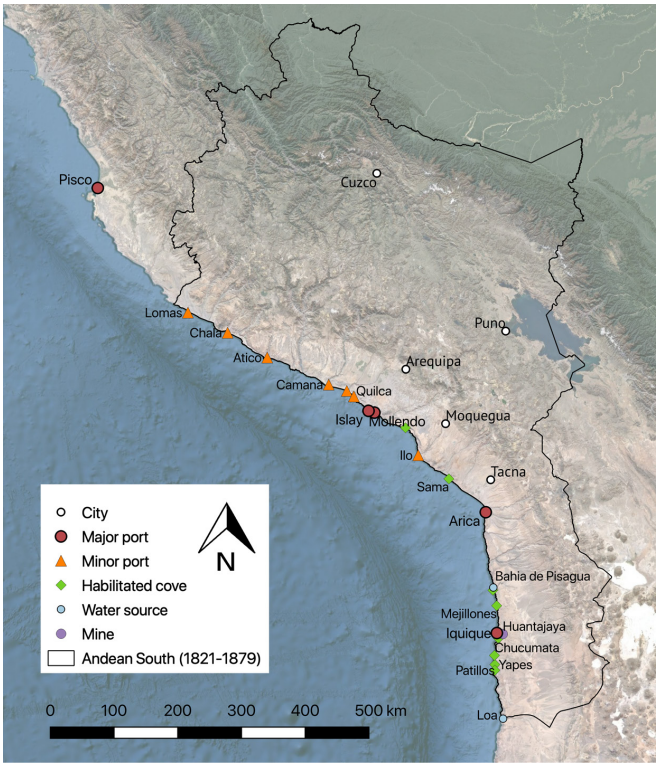

Fig. 2. Area of study (Created by Author).

engagement with economic powerhouses of the North Atlantic, such as Great Britain, France and the United States, favoured liberalising trends, such as the commissioning of more Pacific ports, and the reduction or the elimination of import duties (Bonilla 1974, 1975; Gootenberg 1989). As a result, maritime ports became important places in global geopolitics, and they were integral to almost any engagement with the world market. As loci of entry and exit for commodities, ports usually housed customs offices, which in turn became the most visible faces of the state before its citizens and foreign dignitaries. The Early Post-Colonial Period, particularly in southern Peru, was marked by a distinct maritime turn in its economic outlook, which included increased participation of Peruvian producers in

Port	Class	Distance to water	Distance to food
Islay	Major port	Import	Far
Mollendo	Major port	Import	Far
Arica	Major port	Local	Local
Iquique	Major port	Import; specialized	Far
Quilca	Major and minor port	Local	Local
Huayna-Pisagua	Minor port	Import; specialized	Far
Camaná	Minor port	Local	Local
Lomas	Minor port	Near	Near
Chala	Minor port	Near	Near
Atico	Minor port	Near	Near
Aranta	Minor port	Near	Near
Ilo	Minor port	Near	Near
Sama	Habilitated cove	Far	Far
Junín	Habilitated cove	Far	Far
Mejillones	Habilitated cove	Far	Far
Molle	Habilitated cove	Far	Far
Yapes	Habilitated cove	Far	Far
Patillos	Habilitated cove	Far	Far
Chucumata	Habilitated cove	Far	Far
Cocotea	Habilitated cove	Local	Far
Bahía de Pisagua	Not habilitated	Local	Far
Loa	Not habilitated	Seasonal	Far

Table 1. Ports included in this study (Created by Author).

the global market, accessed through maritime ports, and the extraction of bird guano from the country's Pacific islands for use as agricultural fertiliser in fields across the world (Cushman 2014).

Here, I examine water and food provisioning as an aspect of state action by the central government that ruled from Lima, through the lens of relational affordances (Gillings 2012). The proliferation of coastal spaces during the Early Republic required ensuring access to avenues of food and water supply to guarantee the survival of these ports' inhabitants and the success of the ventures within them. Interest in the provisioning of food and water characterised the tumultuous context of the era, and shaped relations of power and domination at the regional, national and global levels. The affordances used here were chosen by their stated importance in nineteenth century records, and reflect social and environmental conditions of the period under study (tables 2, 3). They do not represent current environmental conditions, as these have changed since the mid-nineteenth century. "Distance to water" refers to water sources known and available between AD 1821 and 1879. The examination below reveals that the uneven responses of the state to the desert conditions of most southern ports were met by the efforts of local governments, reliance on Colonial trade networks and the actions of capitalist agents.

Early Post–Colonial Peru

The first decades of the Republic were a period of instability. After the Declaration of Independence in 1821, royalists and patriots continued to fight until the definitive victory of the patriots in Ayacucho in 1824 (Basadre 1968). By 1827, the political struggles for the control of Lima ensued until the temporary rise of Agustín Gamarra (Basadre 1968). In 1834, the internal unrest and international instability led to open civil wars, until the formation of the Peru-Bolivia Confederation (1836 and 1838) (Basadre 1968). Gamarra was back in power in 1839 and held the position until his death in 1841. At this point, the national state disintegrated, until Ramón Castilla, consolidated the rule of Lima, pacified regional military leaders, engaged civil elites and institutions, and inaugurated a period of state building that lasted until the 1860s (Gootenberg 1989; Lynch 1992). This stability was aided by the immense riches brought by the export of

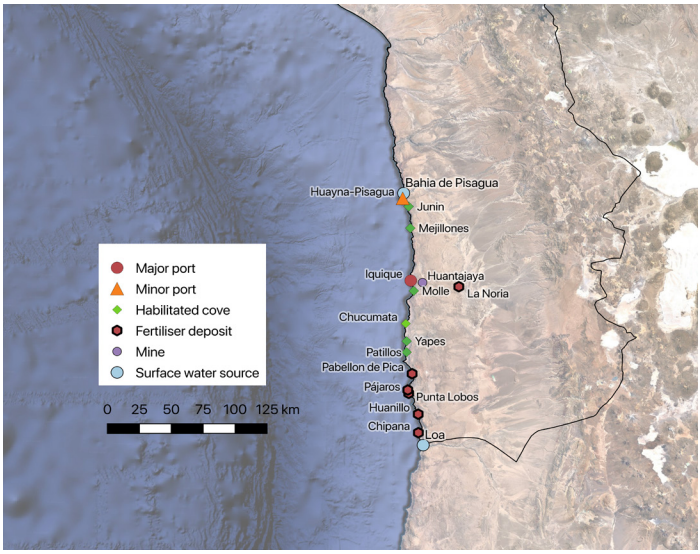

Fig. 3. Guaneras del sur (1821–1879) and sites included in this study (Created by Author).

an agricultural fertiliser, island *guano*, the first boom-and-bust-cycle of the Republic. Between 1840 and 1879, Peruvian *guano* exports reached 12.7 million metric tons, mostly extracted from the Chincha islands, northern islands and the Guaneras del Sur (figs. 1, 3; Cushman 2014: 45; Deustua 2011; Gootenberg 1989). By the early 1870s, the signs of crisis were beginning to show, such as the rise of nitrate as a fertiliser, the depletion of *guano* sources and the effects of the prolonged mismanagement of national finances (Cushman 2014; Deustua 2011; Gootenberg 1989). The disastrous decade for Peru ended with the War of the Pacific, which pitted Peru and Bolivia against Chile (1879–1884).

The Early Republic was also distinctly fragmentary, with an increased economic balkanisation of the south with the city of Arequipa as its epicentre (figs. 1, 2) (Flores Galindo 1977; Gootenberg 1991). The city's location far from the sea resulted in its isolation from the potentials

of economic growth offered by an adequate maritime port. To reach the Pacific overland from Arequipa, one must cross narrow valleys, deep ravines and deserts. Once the ocean is reached, conditions do not improve—natural harbours are few, far between and tend to lack adequate mooring capacity (Fitzroy 1839a, 1839b; García and García 1863). Most ports operated out of coves exposed to sudden changes in wind and ocean currents that caused the loss of many vessels and piers. To compound the problem, some of these coves had strict limits for vessel sizes, and only a few afforded protections to smaller ships (Flórez Nohesell 1986).

The Ports of Southern Peru

At the beginning of the Republic ports were commissioned in a three-tiered hierarchy (table 1). Major ports were the centre of international trade and were the seat of port captainships and customs houses. These places connected Arequipa to most Peruvian seaports and ports across the Pacific, Atlantic and Indian Oceans, including Liverpool, Le Havre, Macau, Baltimore and Reunion (Boza Cuadros 2017). Minor ports channelled regional trades and the traffic of imports once they had cleared all duties in major ports, and foreign vessels could only call there with a special license. Habilitated coves[1] were authorised for the traffic of valley goods into the coastal trade networks and for *guano* (Flórez Nohesell 1986). The facilities examined in this paper held one or more of these commissions throughout the studied period and are summarised in Table 1.

These ports can be classified according to their relations with inland cities, too: Quilca, Islay and Mollendo, as well as most of the minor ports and habilitated coves along the modern Arequipa coast were within Arequipa's area of influence. Ilo serviced Moquegua, and Arica serviced Tacna and most of the Bolivian markets, a mercantile connection that dates back to the Colonial Period (Condori 2010:23.; Díaz Araya et al. 2012). The ports of the far south became known as the Guaneras del Sur (fig. 3) due to their fertiliser deposits and southern location; Iquique was the major port and main settlement of the region (Flórez Nohesell 1986; Boza Cuadros forthcoming).

[1] "Habilitated cove" is the legal term for third-tier ports as it appears in Peruvian nineteenth-century trade codes.

Quilca, Islay and Mollendo

The port at the cove of Quilca (fig. 2) served as the major port for the city of Arequipa until 1826, when new facilities were inaugurated at Islay citing unfavourable conditions in Quilca (Condori 2010). The narrow cove of Quilca required that vessels moor a mile south and all loading and off-loading was done on boats and rafts across rough open waters before entering the inlet (Fitzroy 1839a, 1839b; García and García 1863). Unpredictable maritime conditions made the anchorage unsafe. Quilca had the advantage of a location near the valley of the same name, which had access to fresh water and foodstuffs, and close connections to the city of Camaná (Flórez Nohesell 1986).

In Islay, sea conditions are better than at Quilca. However, the location of the cove created new challenges. Governor Gutiérrez de La Fuente inaugurated a canal system to provide the settlement with water from the nearby hills in 1828 (El Republicano Vol. 4 N. 41 10 October 1829, p. 5). The port channelled most of Arequipa's trade, as well as imports and exports to and from Cuzco and Puno (Bonilla 1974b). Starting in the 1820s, foreign trading houses and dignitaries established in Arequipa opened branches in Islay. While water supply was mostly met by canals, agriculture was impossible locally, so foodstuffs mainly were transported from the Tambo and Quilca Valleys (Witt 2016).

Islay operated as Arequipa's single major port until 1871. It was partially abandoned in favour of Mollendo, which had been chosen as the Pacific terminus of the Arequipa railroad since the construction of the railroad to Islay was deemed too costly (Camacho 1871). Mollendo's natural capacity for receiving small boats only required building a new harbour. Most of these investments were privately funded through a bidding process organised by the state (Camacho 1871). A new system of running water was inaugurated in 1873 by a private enterprise by the Hart Brothers based in Lima. This system required transporting water from Uchumayo near the city of Arequipa and was lauded as "the greatest work of its kind in the world" (The Peruvian Evening Chronicle Volume 1, N. 12, 28 April 1873, P. 2.). As in Islay, Mollendo depended on the coastal trade networks for food supply, mainly from the Tambo valley (Office 1875).

Arica and Iquique

Farther south, Arica and Iquique operated within networks aligned more closely with Bolivia and the Guaneras del Sur, respectively. Arica enjoyed several advantages over the rest of the ports in this study: freshwater wells, an extensive *totoral* (a swampy reed bed where reeds grow naturally) and abundant arable land nearby, as well as good anchorage (Castro 2005). The abundance at Arica made it a desirable spot for navigators, who could find affordable supplies there (García and García 1863).

Iquique, in contrast, offered none of these advantages: there was no surface water for hundreds of kilometres, and almost everything that could be purchased had to be imported. The extreme natural conditions had thwarted the establishment of Iquique as a port for the export of silver from the mines of Huantajaya in the Late Colonial Period and the Early Republic. Avenues of water supply included its transport in rafts made of sea lion hides used by *Camanchaca* fishing communities from indigenous

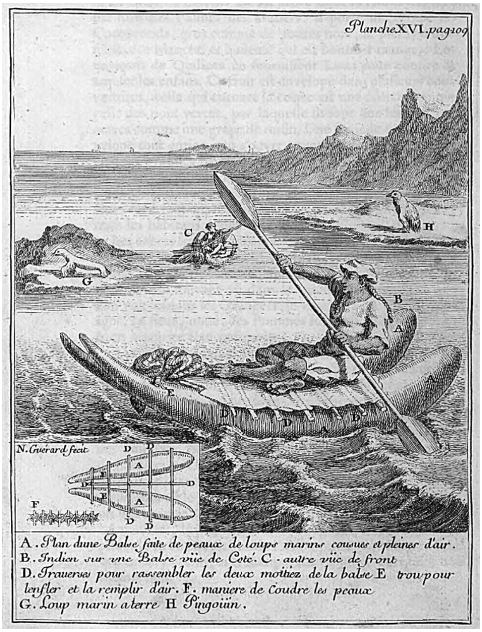

Fig. 4. *Camanchaca* fisherman on a sea lion hide raft (Frézier, 1716, p. 109 Plate XVI).

settlements in Loa and Bahía de Pisagua (fig. 4; Billinghurst 1893, 1908). Cistern ships from Arica also provisioned water in a two–way system where the tank vessels brought water to Iquique and then returned to Arica with guano (Billinghurst 1893, 1908). After 1840, machines that desalinized ocean water were imported by foreign entrepreneurs (Billinghurst 1893, 1908). However, water remained scarce and expensive after the arrival of the devices. Food supply depended almost exclusively on coastal trade and was quite costly, as were all other goods for sale at Iquique (García and García 1863).

Minor Ports and Habilitated Coves

Minor ports were commissioned for the introduction of imported goods after these had cleared customs in major ports, and served the neighbouring highland provinces. Most of these were commissioned with the stated purpose of stimulating agricultural trade in nearby valleys, and the minor ports of the Guaneras del Sur were supposed to facilitate the export of fertilisers. Minor ports were located in less-than-ideal places for the most part: Quilca presented the anchorage issues raised above; piers and shallops at Chala were destroyed repeatedly by the tides (Boza Cuadros 2018), and infrastructural conditions were lacking in all minor ports (Boza Cuadros 2018, forthcoming). The minor ports of the Guaneras del Sur also presented poor conditions like Iquique's; desalinizing machines were imported into Huayna-Pisagua (Billinghurst 1889). Despite the challenges of their locations, some of these minor ports were vital to their hinterlands due to their intricate connections to the economies of the valleys and neighbouring inland provinces. Some of them were eventually elevated to major ports and most are still used in some maritime capacity today.

Habilitated coves were tertiary ports used in the inter-valley coastal trade, and for the distribution of island guano. Complexes of extraction, collection and distribution of guano in Cocotea and Sama connecting them to coastal valleys and the highlands were continuations of colonial networks with Pre–Hispanic roots (Boza Cuadros 2017). Farther south, Chucumata, Molle and Patillos served as points of extraction, storage and

Local	Water sources found at the port or within 2 kilometres
Near	Water sources found between 2 and 10 kilometres OR within a day's travel/voyage
Far	Water sources only available over 10 kilometres OR over a day's travel/voyage
Import	Water hauled from distant sources, whether by canals or sea vessels
Seasonal	Surface water available locally only part of the year
Specialized	Use of technologies for the capture, desalinization or other process to make water potable in situ

Table 2. Definitions of distance to water (Created by Author).

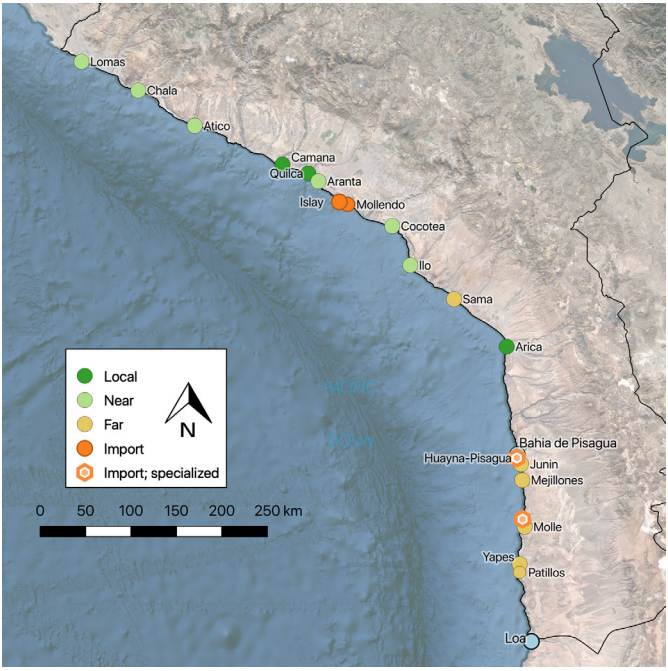

Fig 5. Water provisioning of ports in southern Peru, 1821–1879 (Created by Author).

shipping of nitrate and guano to Iquique, from where it would be exported overseas (García and García 1863). Water could be procured from the underground only in Cocotea (Boza Cuadros forthcoming; Fitzroy 1839a, 1839b; Flórez Nohesell 1986; García and García 1863; Hidrográfica 1879). These coves were supplied by muleteers, who also brought guano and other goods inland (Bowman 1924; Gootenberg 1991). Two coves in the Guaneras del Sur were not commissioned for trade, yet were important during this period: Loa and Bahía de Pisagua. Both supplied Iquique and other points in the region with water via maritime routes (Billinghurst 1893, 1908).

Supply of Water

The trajectories of ports and coves along the southern coast at the beginning of the Republic reveal both the importance of maritime spaces during this period, and the disparate responses to the desert conditions at these ports. For example, not all commissioned loci necessitated infrastructural improvements. The best in-situ access to fresh surface water was at Arica, where wells were available and could also be found in the nearby Azapa valley (fig. 5, table 2). Water could be found within two kilometres of Camaná and Quilca since they were close to the Camaná and Quilca Rivers, respectively. There, water was hauled by land, since it was impossible to disembark near the river mouths (García and García 1863). Minor ports were typically located between two and ten kilometres from water sources, and provision in these cases depended either on muleteers or the sale of water in places where surface water was available, making the product relatively expensive (Flórez Nohesell 1986; García and García 1863; Raimondi 1929). In the case of Chala, for instance, brackish water could be found about 5km from the port in Capa, and better, fresh water could be found farther inland in the Chala valley. The prices for each were two and four reales per load, respectively, once transported to the cove (Raimondi 1929: 16–17), an elevated price considering that the administrator of the post office earned just under 16 reales per day in 1862–1863 (Peru 1864: 62) and an urban day labourer earned seven or eight reales per day (Gootenberg 1990: 40). A supply system was planned for Chala at the cost of 28,707 soles (1 sol = 10 reales; Gootenberg 1990),

a significantly higher number than the real cost of new water pipes for Islay that year (7000 soles; Peru 1864: 102).

Special infrastructural projects took place in Islay and Mollendo, which were located far from water sources. In the case of Islay, the establishment of the port included building a system of canals that provided water from ravines near the port. The Arequipa government financed this first enterprise. In later years renovations and improvements were auctioned by the national government in Lima; bidders typically included both foreigners and Peruvian nationals. In Iquique, water was provided by camanchaca fishermen from as far as Bahía de Pisagua and Loa; by schooners especially outfitted with water tanks from Arica; and by locally established entrepreneurs who imported desalinizing machines (Billinghurst 1893, 1908). Provisioning by sea resulted in expensive water, although it was regular; the desalinizing machines provided a local, but not cheaper, alternative (Billinghurst 1908, Castro 2005). Water supply for Huayna–Pisagua was similar to Iquique's, albeit at a smaller scale (Castro 2005).

Most habilitated coves were located far from water sources, and they depended on the action of muleteers and indigenous fishing communities for the provisioning of water. These places were scarcely inhabited: only a few families lived in Sama (García and García 1863), and Cocotea was only sporadically occupied until the 1840s. The situation was even more dramatic in the coves of the Guaneras del Sur, some of which were not permanently occupied until the early 1860s (García and García 1863). In addition to maritime supply connected to the fertiliser trade at these coves, the possibility that water was collected during the fog season cannot be ruled out (Castro 2005).

Supply of Food

Most or all sustenance could come from the sea for these ports. At this time, however, a well-supplied port was one with access to plenty of fresh fruits and vegetables, cheeses, fresh and dried meats, and other agricultural products (García and García 1863). This provision concerns the life of people on land as well as crews on board ships. Major ports served as

Local	Fresh produce and other agricultural products found at the port or within 2 kilometres
Near	Fresh produce and other agricultural products available between 2 and 10 kilometres OR within a day's travel/voyage
Far	Fresh produce and other agricultural products only available over 10 kilo-metres OR over a day's travel/voyage
Import	Fresh produce and agricultural products from distant sources, including foreign productive regions

Table 3. Definitions for distance to food (Created by Author).

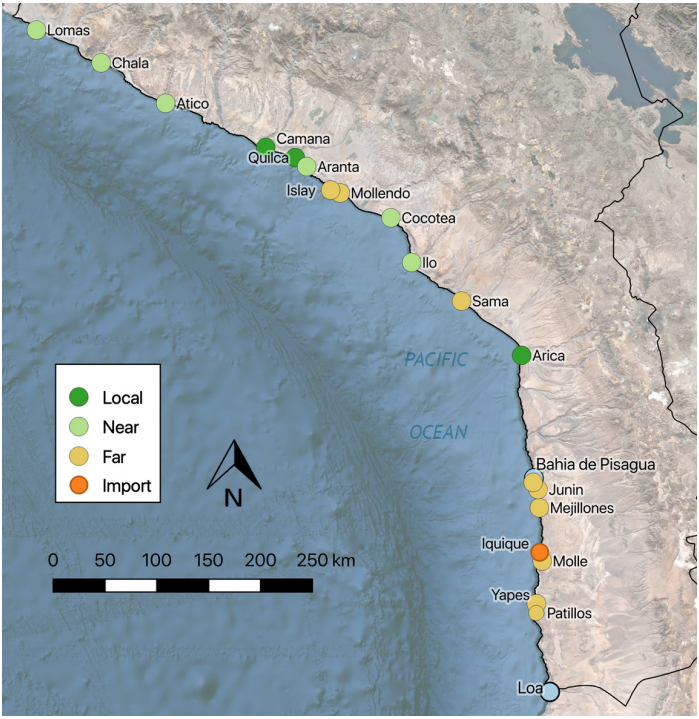

Fig 6. Food provisioning of ports in southern Peru, 1821–1879 (Created by Author).

supply stops for ocean-going vessels as well, and the availability and cost of fresh food and water at these ports impacted their desirability for visiting ships. Closely connected to the availability of food for human life is that of food for pack animals. These ports were nodes in broader, land-based networks, and they were as much land ports as they were seaports. The scarcity of food that impacted human life also hindered the growth and maintenance of pack animals.

None of the ports considered here could sustain agriculture locally, except Arica. All ports north of Arica were supplied with agricultural products from the nearby provinces and river valleys, mostly by muleteers, valley farmers/traders and through the coastal trade (fig. 6). The valley of Tambo supplied the ports at Islay and Mollendo and the cove of Cocotea, all of which are within a day's travel from the valley. Muleteers provided Sama with food when they descended onto the cove to collect guano destined for inland valleys. Lomas, Chala and Atico were likewise supplied by farther away valleys (5–10km away). In the far south, populations were more reliant on the sea and imports than farther north. Conservative economic measures at the beginning of the Republic constrained the access of foodstuffs into the port and limited the growth of Iquique until the mid-century (Gootenberg 1989). Regular supply of food was only assured in Iquique once foreign capitalists were firmly established at the port. Even then, foodstuffs remained scarce and expensive (Hidrográfica 1879).

Final Reflections

State formation was slow and ineffective along the coast. The Peruvian state struggled to maintain conditions adequate for fostering maritime trade in the region and, as a response, southern interest groups established across the cities and ports in the region financed necessary improvements. The conditions along coastal Arequipa were less than ideal for nineteenth century maritime-based commodity trade. The limited number of natural harbours along Arequipa's coast funnelled human activity into a few coastal loci in arid areas. A lack of surface water at these places and their relative distance from non-maritime food sources further complicated life

and trade. The strategies employed to overcome these hindrances fall into two broad categories.

The first had at its roots the indigenous knowledge of southern communities, particularly fisher folks and muleteers. Navigation technologies such as sea lion hide rafts used by camanchaca fishing communities (fig. 4), and their extensive geographical knowledge of the coast. Their knowledge was vital for the survival of port communities and ship crews, especially in the first years of the Republic. In places such as Iquique, human life could only be sustained because of their labour. Valley economies were fuelled by the distribution of products to cities, towns and, of course, ports. Muleteers conducted much of this action on land. The second category of survival strategies was through the action of capitalists, both Peruvian and foreign. Foreign capitalists established at ports were connected to the importation and financing of novel technologies, such as desalinizing machines and railroads.

This study demonstrates that the availability of water and food at the ports of southern Peru at the beginning of the Republic was as much a local preoccupation as it was an interest of regional governments. It also marks a nadir in stately presence and operation that, along with the extreme precariousness of its offices, underscores the weak institutional structure of the emerging Republic. The reliance on indigenous knowledge, regional governments, and southern and foreign capital show that the Republic of Peru retained a reliance on Colonial and Pre-Hispanic networks, as well as the active engagement of the Early Post-Colonial Peruvian south with the global economy.

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